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APHIDIUS UZBEKISTANICUS (HYMENOPTERA: APHIDIIDAE) ESTABLISHED IN IDAHO

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Abstract.—Exotic parasites of *Diuraphis noxia* (Mordvilko) (Homoptera: Aphididae) were released in Canyon Co. Idaho in 1988. A survey in 1994 indicated that *Aphidius uzbekistanicus* Luzhetzki had become established; however, the parasites were found attacking two other cereal aphids, *Sitobion avenae* (Fabricius) and *Schizaphis graminum* (Rondani), but not *D. noxia.* The establishment was achieved by releasing wasps into small, shaded cages for 2–5 days.

Key Words.—Insecta, *Sitobion avenae, Diuraphis noxia, Schizaphis graminum,* Aphididae, biological control, *Aphidius uzbekistanicus,* Aphidiidae

Diuraphis noxia (Mordvilko) (Russian wheat aphid) is a recently introduced pest that has caused considerable damage to small grains in the western United States (Webster & Amosson 1994). It is under good natural control in its native range (SEH, unpublished observation), suggesting that classical biological control could minimize the impact of *D. noxia,* as well as reducing the need for pesticides. A national effort was initiated under the auspices of the Western Regional Coordinating Committee—66 (WRCC—66) to procure and establish exotic natural enemies of *D. noxia.* This paper documents the release and establishment in Idaho of one of the natural enemies (*Aphidius uzbekistanicus* Luzhetzki) obtained through WRCC—66.

MATERIALS AND METHODS

Origin of Released Natural Enemies.—The strain of *A. uzbekistanicus* released in Parma (Canyon County) Idaho came from Turkey. It was collected by Tadeusz Poprawski and Françis Gruber in the spring of 1988. The culture went through quarantine at the European Parasite Laboratory near Paris, France (USDA-ARS) and at Texas A&M University, College Station, TX. In August, 1988, a shipment of this culture was received for propagation and release in Idaho.

Propagation of A. uzbekistanicus in Idaho.—The culture of *A. uzbekistanicus* was maintained on *D. noxia,* which in turn, were raised on spring wheat, cv. 'IDO-232,' courtesy of the Idaho wheat breeding program. Wheat plants were

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seeded at a rate of about eight per 15 cm diameter pot. They were at least 6 wk old (but not heading) when infested with *D. noxia*. Cultures were kept in 41 × 46 cm cages that had slanted glass tops installed about 40 cm above the floors. Cultures were maintained by transferring 50–100 parasites into a cage with fresh aphids rather than by adding aphid-infested plants to existing cultures. Parasites were harvested in groups of about 100 for release.

Release Procedure.—Parasites were released throughout the late summer and autumn of 1988 in cages about 1 m long, ½ m wide and ⅓ m high covered with white chiffon material. A-frame tents of cotton percale cloth were used to shade the cages in hot weather. Releases were made in the late afternoon or evening into naturally occurring *D. noxia* infestations in mixed perennial grasses interseeded with winter wheat and into volunteer wheat in the fall. Release locations were 1–5 km north of Parma, Idaho. Cages and tents remained in place 2–5 d, until they were needed for more releases.

Recovery Surveys.—An attempt was made to recover *A. uzbekistanicus* in the same fields where it had been released by collecting mummified aphids and allowing the parasites to emerge in a 95% humidity chamber; however, we were unable to recover any *A. uzbekistanicus* in 1988. Limited collections in 1989–1991 also failed to find any *A. uzbekistanicus*.

A more extensive survey was conducted at the University of Idaho Parma Research & Extension Center during the 1994 growing season. Spring wheat, cv. 'Penawawa' was planted on 15 Mar, 12 Apr and 10 May 1994. The last planting was planted extremely late for the Parma area in order to ensure high populations of aphids. Each planting occupied about ⅓ of the entire 0.4 ha. field.

Sampling began in the first two plantings on 11 May, and samples were taken in all plantings every two weeks thereafter until the wheat matured past the point where it would support aphid populations on 18 July. Fall samples were taken in volunteer wheat at the Parma Research & Extension Center on 15 October. Mummies were collected directly from the field and isolated by aphid species in ¼ dram shell vials with cotton stoppers. Randomly selected tillers (n = 150–600) (Feng et al. 1992) were inspected biweekly from each planting date until wheat matured. Additionally, living aphids were collected each sampling period and established singly on wheat leaf sections in 50 mm petri dishes. On each sampling period, 100 *D. noxia* and 50 of each other species present in sufficient quantities were collected (Feng et al. 1992).

Results and Discussion

Parasites Reared from Mummies on Spring Wheat.—A total of 327 mummies were collected from spring wheat during the sampling season. Rearing 25 *D. noxia* mummies yielded 14 *Diaeretiella rapae* (M'Intosh) and 10 hyperparasites (Table 1). The most abundant aphid species for which mummies were collected was *Sitobion avenae* (Fabr.). The 167 *S. avenae* mummies yielded 35 *A. uzbekistanicus*, 15 *Aphidius ervi* Haliday, four *Aphidius* sp., one *D. rapae* and 112 hyperparasites. Samples of 12 *Schizaphis graminum* (Rondani) and 13 *Metopolophium dirhodum* (Walker) yielded two and zero *A. uzbekistanicus*, respectively.

Parasites Reared from Living Aphids Established in Petri Dishes.—Thirty *D. noxia* mummies were reared from which parasites eventually emerged (Table 2). An additional 55 parasites were obtained from *S. avenae*. *Diaeretiella rapae* was

Table 1. Parasites collected from cereal aphid mummies on spring wheat, Parma, ID, 1994.

Aphid host	Primary parasites					Hyperparasites			
	Aphidius uzbekistanicus	*Aphidius ervi*	*Aphidius* spp.	*Diaeretiella rapae*	Unknown	*Alloxysta* spp.	Pteromalidae	*Dendrocerus* spp.	Total
Diuraphis noxia	0	0	1	14	0	2	8	0	25
Sitobion avenae	35	15	4	1	0	0	109	3	167
Metopolophium dirhodum	0	4	1	0	0	0	8	0	13
Schizaphis graminum	2	2	3	1	1	0	3	0	12
Unknown host[a]	21	53	9	24	0	1	2	0	110
Total	58	74	18	40	1	3	130	3	327

[a] Parasites emerged during field collection and transport to the laboratory, thus they could not be isolated by host.

Table 2. Parasites that emerged from live aphids collected on spring wheat, Parma, ID, 1994.

Aphid host	Primary parasites				Hyperparasites	
	Aphidius uzbekistanicus	*Aphidius ervi*	*Aphidius* spp.	*Diaeretiella rapae*	*Pteromalidae* spp.	Total
Diuraphis noxia	0	2	0	27	1	30
Sitobion avenae	11	18	5	1	20	55

by far the most common parasite of *D. noxia,* while *Aphidius* spp. were more common parasites of *S. avenae.* Hyperparasites were more common in *S. avenae* mummies than in *D. noxia* mummies.

Eleven *A. uzbekistanicus* were recovered from *S. avenae* reared in petri dishes. *Aphidius uzbekistanicus* accounted for 21 and 20% of total parasitism of *S. avenae* in field collections and rearing of live specimens, respectively. The percentage contributed by *A. ervi* was higher among live collected *S. avenae* than among parasites reared from field collected *S. avenae* mummies (33% and 9% respectively). The reverse was true for hyperparasites (36% for live collected; 65% for mummies), suggesting that hyperparasites may prefer *A. ervi* mummies over *A. uzbekistanicus* mummies; however, we could not associate specific hyperparasites with *A. uzbekistanicus* because all *Aphidius* mummies are similar.

Our results are similar to the extensive pre-release baseline surveys of Feng et al. (1992) in that *D. rapae* was more commonly found in *D. noxia* mummies than in mummies of other aphid species. Hyperparasites were also much more common in *S. avenae* mummies in both surveys. The collections of *A. uzbekistanicus* represent a recovery of parasites released in 1988; however, so far, none have been found parasitizing *D. noxia.*

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